Falls: Prevention and Management

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Key Points

- Falls are common in older people—30% of people over 65 years of age and 50% of people over 80 years of age are likely to fall within the next year, the fifth leading cause of death in elderly.
- Five percent of older fallers will have a major injury such as fractured neck of the femur, subdural hematoma, etc.
- Following a fall 30–40% of fallers develop fear of falling and curtail their activities.
- Falls are expensive, and there needs to be a 66% reduction in incidence of falls to maintain current healthcare costs.
- Falls are preventable, and a systematic approach to identifying risks and addressing them in a concerted manner is key to prevention.

Case Study

Mrs. SJ, an 88-year-old woman, is admitted via the emergency department after a fall in her kitchen while turning to reach for a cup on the kitchen counter. She has sustained a fractured left neck of the femur.

She is a widow and lives alone at home with community support. She needs help to shower and dress. She also receives help with household cleaning, laundry, cooking and shopping. She uses a four-wheel walker to mobilize as she suffers from osteoarthritis but reports she has been unsteady for about 6 months.

Her other comorbidities include short-term memory loss, hypertension and depression. She was last admitted to hospital 8 months ago with a fall and dislocated left shoulder. That admission was complicated by a period of delirium and pneumonia.

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Her medication list includes paroxetine 20 mg daily, temazepam 10 mg nocte, aspirin 150 mg daily, atenolol 50 mg daily, bendrofluazide 2.5 mg daily and diclofenac 75 mg SR daily.

Examination shows an alert somewhat disorientated elderly woman. She weighs 49 kg (obtained from general practitioner records). Her heart rate is 60 beats per minute and BP lying 140/80 and sitting 120/75. The cardiovascular examination is normal. She has evidence of osteoarthritis in both knees. Limited neurological examination was normal. Visual acuity was 6/24 in the right eye and 6/18 in the left.

The following three questions would act as a good guideline to the treating physician in managing the issue of "falls" with this patient, even as the fractured hip is attended to:

1. How likely is she to fall again?
2. What are her risk factors for falling?
3. What can you do to reduce her risk of falling again?

These questions can form the basis of further discussion on this topic.

The evolution of humans as a species has seen us assume an erect posture. This evolutionary advantage has also resulted in a condition unique to human kind—risk of falls. As we age, with various factors threatening our ability to keep our posture erect, this risk increases, impacting on quality and length of life with risk of various injuries and death. In fact "falls" in the elderly have the dubious honour of being a geriatric syndrome. As our society succeeds in achieving an ageing population, falls in the elderly have become an increasing concern. Preventing and managing the outcome of falls remains a challenge for health professionals and society.

Research in this field has been challenging. Assessing the success of a falls intervention programme is difficult due to fundamental methodological issues (e.g. the absence of blinding). However, fortunately a large amount of information is now available to health professionals.

WHO defines a fall as "an event which results in a person coming to rest inadvertently on the ground or floor or other lower level".

- Falls are common in older people—30% of people over 65 years of age and 50% of people over 80 years of age are likely to fall within the next year [1–3].
- Falls are the fifth leading cause of death in the elderly.
- Five percent of older fallers will have a major injury following a fall, such as a fractured neck of femur or subdural hematoma [4].
- 30–40% of fallers develop fear of falling and curtail their activities [5, 6].

8.1 Cost of Falls

An estimate by the Australian Commission on Safety and Quality in Healthcare completed in 2008 predicts a rise in cost from AUD 498.2 million in 2001 to AUD 1375 million in 2051 and 886,000 additional bed days per year by 2051. It is

projected that 3320 additional residential care facilities will be required to deal with falls-related incidences over this period.

There needs to be a 66% reduction in the incidence of falls to maintain current healthcare costs. In New Zealand, the Accident Claim and Compensation Organization (ACC) data in 2008 showed that, out of 128,000 claims totalling NZD 1.9 billion, 38% were falls related and 44% of these happened around the home of the patient. Clearly, falls are a significant challenge both for society and the individual. Falls also lead to a substantial inpatient burden.

An elderly person who sustains a hip fracture has a 20% risk of dying within a year and another 20% of these patients require a change in their living circumstances, often needing residential care. Hence, a fall can certainly be a fearful event for an older adult.

8.2 Risk Factors for Falling

Several epidemiological studies have looked at this issue. The risks can be divided into intrinsic and extrinsic factors.

Intrinsic risk factors include:

- Muscle weakness
- Balance disorders
- Cognitive impairment
- Depression
- Visual deficits
- Age >80 years
- Postural hypotension
- Syncope or "funny turns"

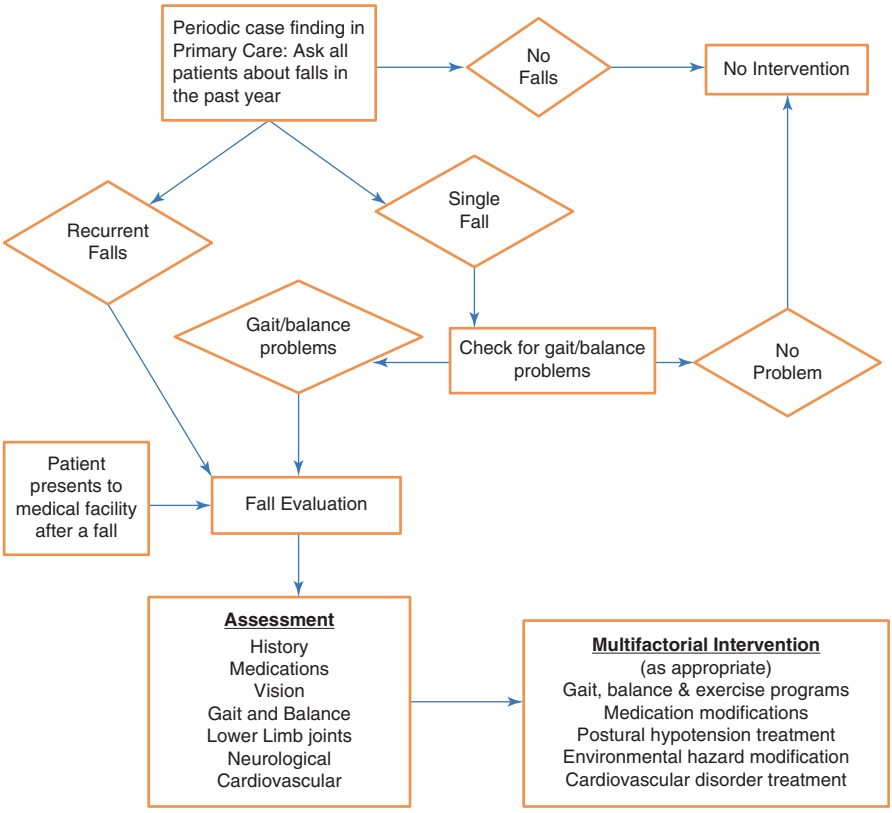
Extrinsic factors include:

- Polypharmacy with >4 drugs
  Psychotropic agents
- Environmental hazards
  Assistive devices
  Restraints
- Lifestyle factors
  Cluttered surroundings

Applying this knowledge to Mrs. SJ, she has at least five risk factors—age, polypharmacy, poor balance, poor cognition and a history of depression—which render a high likelihood of falling again.

She requires urgent review of the risk factors and modification where possible as well as minimizing the risk of injury. The next part of this chapter will address these strategies.

Algorithm for Falls Assessment and Management



8.3 Risk Management

As with many other strategies used in dealing with older patients, falls prevention needs a multidisciplinary approach [12, 13]. A Cochrane review from 2012 summarized that multifactorial interventions are required to ascertain a patient's falls risk and then implement treatment or referrals which will minimize the risks identified [14, 15]. For the most part, the most recent evidence available indicates that this type of proactive intervention reduces the number of falls in the elderly community [16].

The *multidisciplinary strategies* may include:

- Medical review
- Physiotherapist input and appropriate exercises
- Occupational therapist assessment and environmental review
- Attention to visual impairment—treating common visual issues in the elderly such as cataract and macular degeneration
- Vitamin D for the appropriate patient [17]
- Delirium prevention and management

8.4 Injury Prevention

This may include the use of hip protectors, movement sensors and other biotechnological tools.

Investigating and considering treatment for osteoporosis are beneficial. This may also involve identifying patients at high risk of falls by using fracture risk assessment tools and appropriate treatment for both preventing and managing osteoporosis.

Research results on all these interventions have at times been conflicting. The 2012 Cochrane review examined the healthcare research information to determine which falls prevention interventions are effective for older people living in the community. This involved 159 randomized controlled trials with 79,193 participants. These interventions included:

- Multifactorial risk management
- Medication review (avoiding polypharmacy)
- Avoiding psychotropic medications
- Treating cardiovascular disorders, postural hypotension and causes of syncope
- Optimizing general condition—vision, nutrition and vitamin D supplementation
- Osteoporosis treatment—appropriate use of fracture risk assessment
- Appropriate application of biotechnology such as falls alarms or self-lighting toilets

8.5 Role of Medication Review and Other Medical Inputs

Obviously certain medications may increase the falls risks for older people. Unfortunately three trials in Cochrane group were unable to reduce the number of falls by reviewing and adjusting medications; however a fourth trial involving general practitioners and their patients in the mediation review process did result in a subsequent reduction in the number of falls.

Additionally, the use of a pacemaker where appropriate can minimize falls in patients whose falls are often a result of carotid sinus hypersensitivity, a condition responsible for unexpected changes in both heart rate and blood pressure. Podiatry input for people with debilitating foot pain through the use of customized insoles, appropriate footwear, orthotic insoles as well as foot and ankle exercises reduced the number of falls for those affected.

8.6 Role of Exercise

A systematic meta-analysis by Sherrington et al. looked at 44 randomized controlled trials with 9603 participants. They concluded that there was a 17% overall risk reduction for falls in those who exercised. The analysis also looked at the variability in results, and the group felt that it was explained by various factors including dose of exercise, level of challenge to balance and presence or absence of a walking programme. The analysis also illustrated the fact that exercise-related

interventions could ironically also increase the risk of falls when applied to the inappropriate patient.

The Otago Falls Prevention Programme has been a well-established and well-used programme that examined the role of nurse-led, function-based balance and gait training for at-risk elderly patients in the community. The programme was shown to be very cost-effective; it also primarily addressed balance.

More recently, El-Khoury et al. [22] have shown that a two-year balance training programme, with both a weekly group session and individual sessions, effectively reduced falls resulting in injuries and also was helpful for women aged 75–85 years, at risk of falling, in improving measured and perceived physical function. As it is not always possible to prevent a fall, there is now more emphasize placed on reducing injurious falls and overall risk of injury [23].

8.7 Visual Impairment and Falls Prevention

Visual impairment is a common problem amongst elderly with cataract and macular degeneration, and detection and treatment have been shown to reduce falls in selected patients [24]. Trials have been limited by small numbers; however one of four trials reviewing cataract treatment as an intervention showed a clear reduction [25, 26].

Campbell et al. [27] showed that a home safety assessment and modification programme by an occupational therapist reduced falls amongst men and women aged 75 years plus, with severe visual impairment.

The following tips are useful in preventing falls in the visually impaired:

- Visually impaired older people have twice the risk of falls as those with normal sight.
- These individuals should be referred to an experienced occupational therapist who can facilitate falls risk modification through a home safety assessment.
- Determining the frequency of falls in the past year is important. Those older people with a recent history of falls will be motivated and hopefully benefit from an exercise programme specifically designed to reduce the frequency of falls.
- Diagnosis of cataracts and their removal will optimize vision and hence prevent falls.
- Extra care is necessary when older people adjust to significant changes in their lens prescriptions.
- Recommend the use of monofocals while walking.

8.8 Role of Occupational Therapist

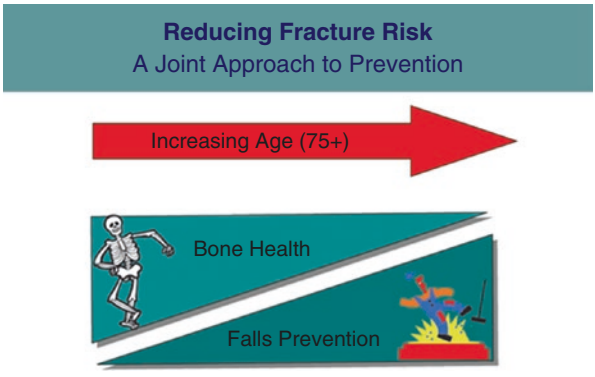
Occupational therapists are particularly helpful in instituting interventions to improve home safety, especially in people at higher risk of falling. For example, shoe device might be needed in icy conditions to prevent injurious falls.

The interventions may differ depending on the setting. Falls prevention for elderly patients admitted to hospital as inpatients may require more focused interventions as follows:

8.9 Vitamin D and Falls Prevention

Vitamin D supplementation may reduce the number of falls for older people in the community where there is a preexisting vitamin D deficiency; however vitamin D supplementation in itself does not appear to reduce falls in general.

There have been several trials assessing effectiveness of vitamin D in preventing falls. Three of these showed positive effects, and at least one had significant negative result. Trials that assessed patients in long-term facilities as expected did show positive impact of vitamin D supplementation.



8.10 Role of Biotechnology

There has been significant research into the use of biotechnology in the area of falls and injury prevention over the last decade. A variety of movement sensors, alert/alarm systems, ultralow beds for patients with delirium, appropriate lighting and non-slip flooring have been trialled in preventing falls and injuries with variable success.

Kosse et al. [28] reviewed 12 studies that looked at the use of sensors to prevent falls and related injuries in the elderly living in residential care settings. Although three trials showed a significant reduction in falls-related injuries (77%), the false alarm rate of 16% was felt to be too high to keep the carer staff focused. The group concluded that staff engagement and careful patient selection are needed when using sensors to reduce falls and falls-related injuries in residential care settings.

8.11 Use of Restraints

This has been a controversial issue, but there is now general consensus that use of chemical restraint (sedation) or physical restraint (e.g. bedrails) does not prevent falls: in fact, it can result in worse injuries. Bedrails, for example, have been shown to cause serious injuries in multiple studies—from asphyxiation to lacerations and dislocated joints. These tend to happen while a confused patient tries to climb over the bedrails.

A guideline in appropriate use of bedrails by the UK National Patient Safety Agency recommends considering certain patient properties such as presence of confusion, patient's mobility/immobility and independence/need for help or hoist. For patients who are confused and immobile, bedrails could be used with care. Bedrails are not recommended for confused patients who are mobile, however; instead these patients should be nursed in low beds. Drowsy patients who are immobile can have bedrails used with care.

8.12 Fracture Risk Assessment Tools

The development of fracture risk assessment tools in the last decade has provided a significant way forward in helping the clinician to assess the individual patient's fracture risk and use bone protection measures most appropriate for that particular patient. These clinically validated tools include FRAX and Garvan,—specific to patients with recurrent falls, and Q Fracture,—a multiple-risk self-populating software-based tool used mostly in the UK. Bone density measure is one of the risk factors used in these tools. The use of several risk factors makes these tools a much more comprehensive way of calculating an individual patient's fracture risk.

Osteoporosis treatment is a crucial part of preventing injury by reducing fracture risk in patients at high risk of falling.

To reduce hip fractures, hip protectors are also advised in these patients, especially those living in residential care settings; however, compliance remains a challenge in this group.

Case Study

We could now apply this knowledge to our patient Mrs. SJ.

Her medications need to be reviewed. As she has postural hypotension, one of her antihypertensive medications could be stopped. Diclofenac may no longer be appropriate for her, given that her renal function is likely to be at least moderately impaired when assessed by checking creatinine clearance. This could be replaced by regular paracetamol in the first instance.

If depression is no longer an issue, then paroxetine could be weaned off.

Temazepam, being a sedative, would certainly add to her risk of falling. Benzodiazepine withdrawal is especially challenging and requires constant engagement with the patient with regular follow-ups.

Good records and communication with the primary caregiver are an essential part of reviewing the medication of an elderly person.

Since Mrs. SJ has cognitive impairment, she will be at high risk of delirium, and strategies to prevent and manage delirium will need to be initiated as soon as possible with full engagement of the multidisciplinary team caring for her. The involvement of an orthogeriatric team right from the outset, with application of principles of older person's care applied, has been shown to improve outcomes for elderly patients with fractured neck of femur such as Mrs. SJ.

Secondary treatment of osteoporosis with an antiresorptive together with vitamin D supplementation, keeping her renal function in mind, would also be recommended. In many countries, a clear osteoporotic or fragility fracture such as hip fracture in an older elderly patient (>75 years) is accepted as sufficient indication of the presence of osteoporosis. In a younger patient, bone density measurement will be necessary. Clinical pharmacists on the ward are helpful in counselling patients in appropriate use of oral bisphosphonate therapy.

Once she has had surgery, timely input from a multidisciplinary team led by a geriatrician, including physiotherapist, occupational therapist, dietician, etc., should assess and facilitate transfer to rehabilitation where she should have discharge planning carried out.

She should also receive further attention and intervention into her risk of falling. An occupational therapist could assess her home setting. Her visual acuity is reduced, and she should be assessed for treatable cause such as cataract or macular degeneration; glaucoma is also a possibility.

A physiotherapist would set up an individualized balance training programme with follow-up in the falls clinic or in the community, as her cognitive impairment is only mild and she is able to follow instruction.

Considering her ongoing risk of falling, hip protectors could be trialled. Her family or community supports should be appropriately engaged and advised.

8.13 Summary

- Preventing falls as a primary end point is important.
- Reducing falls will impact on fracture risk.
- There is a welcoming evidence that several types of falls can be averted.
- A "one size fits all" approach will not work.
- More work is required to align falls and bone health services and to engender a more pragmatic and tailored approach to risk minimization.
- Addressing the prevention of falls and the subsequent injuries should be multifactorial involving point of care and critical levels.
- Consumer engagement is an integral element to successfully preventing falls and minimizing their harm.

Best practice will include identifying falls risks, implementing targeted individual strategies. These strategies will require ongoing resources to ensure they are regularly reviewed and monitored.

The best way to affect a successful falls prevention programme is to involve staff across all healthcare facilities to provide a multifactorial approach.

A time lag would naturally be expected between initial implementation of a falls prevention programme and a measurable improvement in outcomes.

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